REMARKS/ARGUMENTS

Reconsideration is respectfully requested.

In the office action, the title of the present application has been objected to for not being descriptive. The title has bee amended to be descriptive in response, and withdrawal of the objection is respectfully requested.

Claims 1-4 are pending in the present application before this amendment. (Claims 5-10 have been withdrawn.) By the present amendment, claim 2 and 4 have been canceled without prejudice, and claims 1 has been amended. No new matter has been added.

In the office action, claims 1-4 stand rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 6,800,512 (Itonaga) in view of U.S. Patent No. 6,573,575 (Yamazaki). The "et al." suffix is omitted in a reference name in this paper.

At the outset, the applicants respectfully agree with the office action that Itonaga is silent to implanting ions in a dose of 1 to 2 x $10^{16}/cm^2$.

However, the applicants respectfully **disagree** with the office action's suggestion that the combination of Itonaga and Yamazaki will teach or suggest the invention of claim 1, now amended.

The present invention is directed to preventing the prior art problems of poly depletion in a CMOS structure. One of many causes of this poly depletion problem in a CMOS structure is due to the varying thickness of the polysilicon (see the specification page 2, lines 23-24, "The level of depletion at the polysilicon **bottom** is highly dependent on the **thickness** of polysilicon").

As shown in FIG. 3A, the height of the STI oxide film that not at or near the boundary line with the active region 33 is higher than (1) the height of the STI oxide film at or near the boundary with the active region 33 and (2) the height of the active region 33. The area at or near the boundary line between the STI oxide film and the active region 33 is referred to as the "fringing portion" as this term originally appears in claim 1 before the present amendment.

Then as shown in FIG. 3B, the polysilicon film 34 formed **not** at the fringing portion (i.e., the non-fringing portion) is thicker than the polysilicon film 34 formed at the fringing portion. This causes additional depletion to occur at the bottom of the polysilicon film 34 at or near the fringing portion (see the specification page 13, lines 7-14).

To solve this problem of prior art, the presently claimed invention teaches ion implantation at a level of 1-2 x $10^{16}/cm^2$, preferably 1 x $10^{16}/cm^2$, which is higher than the conventional dosage of about 5 x $10^{15}/cm^2$ (see the specification page 13, line 15 to page 14, line 2). The higher dosage will inhibit the poly depletion effect as disclosed in the specification page 13, line 23 to page 14, line 2.

Then, as disclosed in the specification page 14, lines 3-8, the resultant structure is heated at higher than 800 degrees Celsius so than the "[[~~depletion~~]] --**thermal diffusion**-- actually occurs below the dotted line in the portion indicated by the oblique lines [as shown in FIG. 3d]. This implies that the depletion at the gate sidewalls is reduced."

Claim 1 has been amended to better clarify this feature of the present invention, namely, claim 1 as amended now recites, inter alia:

wherein the polysilicon film formed at or near the fringing portion is **thicker** than the non-fringing portion of the polysilicon film

wherein the ion implantation of the N-type impurity is performed by implanting phosphorus in a dose of 1 to 2 x $10^{16}/cm^2$,

after the step of patterning the polysilicon film, heating at a temperature higher than 800 degree Celsius **allowing thermal diffusion of the ion-implanted impurities into the bottom portion of the polysilicon film formed at or near the fringing portion**

This claimed feature of claim 1 is not taught or suggested in Itonaga or Yamazaki, whether these references are considered individually or in combination.

It is well founded in the patent case law and consistently in MPEP that the Examiner bears the **initial** burden of **factually** supporting any prima facie conclusion of obviousness. MPEP §2142. There are three requirements to establish the prima facie obviousness. MPEP §2143.

(1) First, the prior art references **must** teach or suggest **all** the claim limitations. MPEP §2143.03.

(2) Second, there must be some suggestion or motivation, either **in the references themselves** or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. MPEP §2143.01.

(3) Third, there must be a **reasonable expectation of success**. MPEP §2143.02.

As to Claim 1 and all other pending claims that depend from it, it is respectfully submitted that the prima facie burden of establishing the obviousness has **not** been met.

First, the applicants respectfully assert that neither Itonaga nor Yamazaki teaches or suggests, inter alia: (1) ion implantation at a higher concentration as claimed

and (2) heating at a temperature as claimed to allow **thermal diffusion of the ion-implanted impurities into the bottom portion of the polysilicon film formed at or near the fringing portion** to solve the prior art poly depletion problems in a CMOS structure. As the examiner concedes, Itonaga fails to disclose the claimed impurity concentration of the ion implantation and Yamazaki fails to disclose the thermal diffusion event to the bottom portion polysilicon formed at or near the –fringing portion– formed due to the variation in the thickness of the polysilicon layer. Thus, even if Itonaga is combined with Yamazaki, not all limitation of claim 1 is taught or disclosed.

Just in case the examiner may consider the "allowing thermal diffusion..." phrase claimed in claim 1 as being a "functional" limitation, the applicants respectfully note the following:

> MPEP §2173.05(g) makes it **very clear** that:
>
> "There is **nothing inherently wrong** with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper. *In re Swinehart,* 439 F2d 210, 169 USPQ 226 (CCPA 1971)."

In fact, the same section of MPEP **requires** that the functional claims should be treated as and be examined "just like any other limitation of the claim":

> "A functional limitation **must** be evaluated and considered, **just like any other limitation** of the claim, for what it fairly conveys to a person of ordinary skill in the art in the context in which it is used." MPEP §2173.05(g).

Second, according to MPEP §2143.01, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference to combine the reference teaching. The suggestion or motivation to combine references must come from the

cited prior art references, either explicitly or implicitly. The mere fact that the teachings of the prior art **can** be modified or combined does **not** establish a motivation or suggestion to combine and make the resultant combination prima facie obvious. **The prior art must suggest the desirability of the combination.** MPEP §2143.01.

The Office Action combines the Itonaga and Yamazaki to reject Claim 1; however, these references do not suggest the desirability of the combination. That is, the mere fact that Yamazaki discloses "implanting phosphorus in a dose of 1 to 2 x $10^{16}/cm^2$" as suggested in the office action does not establish a motivation or suggestion to combine and make the resultant combination prima facie obvious, because Yamazaki fails to suggest the desirability of the combination. There is no teaching or suggestion in Yamazaki that by implanting such a high does of phosphorus ion into a polysilicon layer and thermally diffusing the ion into the bottom area where there is a variation in the thickness, the poly depletion problem in a CMOS dual gate structure can be prevented. In absence of such teaching or suggestion in Yamazaki, it would not be possible for any one of ordinary skill in the pertinent art to learn from Yamazaki's teaching of "implanting phosphorus in a dose of 1 to 2 x $10^{16}/cm^2$" and be desirous to combine it with Itonaga to produce and make the claimed invention.

The Applicants respectfully submit that the conclusive statement of obviousness in the Office Action that the Yamazaki's ion dosage can be applied to solve the poly depletion problem of prior art is based on an impermissible presumption. Applicants' response to such a conclusive statement of obviousness is that the basis for improperly finding the presently claimed invention obvious appears to be the teaching found in this application, and not in the prior art. Thus, the obviousness rejection in the Office Action

improperly relies on the **impermissible hindsight reasoning**, because the rejection would not be obvious absent Applicants' disclosure in this application that discloses the claimed invention. (See 37 C.F.R. § 1.104(c)(2).)

According to MPEP §2142, the hindsight reasoning based on Applicants' own disclosure is not permitted. Knowledge of Applicants' disclosure must be set aside. The Examiner must step back in time to when the invention was unknown and just before it was made. Only the fact gleaned from the prior art may be used.

Third, according to MPEP §2141.01(a), any prior art reference, in order to be modified or combined with another prior art reference, must be "analogous" to the claimed invention. In order for a prior art reference to be "analogous" to the Applicants' claimed invention, the prior art reference **must** (1) be "in the field of Applicants' endeavor;" or (2) if, not, then it must be reasonably pertinent to the problem addressed. In re Wood, 599 F.2d 1032 (CCPA 1979). Yamazaki is not analoguous to the presently claimed invention because Yamazaki is not in the field of CMOS and it is not reasonably pertinent to the solving pertinent problems related to the poly depletion problems in a CMOS structure.

For the reasons set forth above, the applicants respectfully submit that claims 1 and 3, now pending in this application, are in condition for allowance over the cited references. Accordingly, the applicants respectfully request reconsideration and withdrawal of the outstanding rejections and earnestly solicit an indication of allowable subject matter. The examiner is authorized to cancel the withdrawn claims if issuance of a Notice of Allowance is proper in the next action. In such a case, the applicants reserve the rights to file a divisional application of those cancelled claims.

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This amendment is considered to be responsive to all points raised in the office action. Should the Examiner have any remaining questions or concerns, the Examiner is encouraged to contact the undersigned attorney by telephone to expeditiously resolve such concerns.

Respectfully submitted,

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